REMARKS

This application has been carefully reviewed in light of the Examiner's action dated June 29, 2004. Claims 1, 12 and 16 have been amended and claims 17-32 have been added. Reconsideration and full allowance are respectfully requested.

Claims 1-3, 10-13 and 16 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent Application Publication 2004/0002637 to Huang et al (hereafter Huang II). As set forth below, all the claims are believed to be allowable as presented and therefore, this rejection is respectfully traversed. The noted claims include independent claims 1 and 12.

As presented, independent claim 1 is directed to a method for controlling optical power in a monitoring device in manner that reduces power consumption without compromising the performance of the device. The method is performed in a monitoring device that is intended for use in determining the amount of at least one light absorbing substance in subject. The device includes emitters for emitting radiation at a minimum of two wavelengths, driving means for activating the emitters and a detector for receiving the radiation at the wavelengths and producing an electrical response to the received radiation. The method includes the steps of supplying driving pulses to the emitters, which have predetermined characteristics that determine the optical power of the device, and demodulating the electrical signal originating from the detector to obtain a baseband signal. The baseband signal is transformed into a frequency spectrum to identify an amplitude and noise level for the baseband signal. The amplitude and noise level are then utilized to obtain a signal-to-noise ratio for the baseband signal. Finally, the method includes monitoring the signal-to-noise ratio of the baseband signal and controlling the duty cycle of the driving pulses in dependence on the monitored signal-to-noise ratio.

Independent claim 12 is directed to an apparatus for noninvasively determining the amount of at least one light absorbing substance in a subject. The apparatus includes emitters for emitting radiation and at a minimum of two different wavelengths and driving means for activating the emitters, wherein the driving means is adapted to supply driving pulses to the emitters that have predetermined characteristics that determine that optical power of the device. The apparatus also includes a detector for receiving radiation from the emitters and producing an electrical signal in response to the received radiation. The apparatus also includes a demodulator unit for demodulating the electrical signal from the detector to obtain a baseband signal. The apparatus further includes a

monitoring means for transforming the baseband signal to a frequency spectrum, generating a signal-to-noise ratio of the transformed baseband signal and monitoring that signal-to-noise ratio. Finally, the apparatus includes a power control means that is responsive to the monitoring means for controlling the duty cycle of the driving pulses.

In both the method and apparatus, a baseband signal, e.g. a "DC component", of the received radiation is obtained. This baseband is then transformed into a frequency spectrum such that a signal-to-noise ratio of the baseband may be identified. This signal-to-noise ratio is in monitored such that the duty cycle of the driving pulses, which are utilized drive the emitters, may be varied such that the total power consumption of the device may be reduced without compromising the performance of the device.

Initially, the applicant notes that the present application has a filing date of September 12, 2003 and claims priority to U.S. Provisional Application No. 60/410,526 having a filing date of September 13, 2002. The disclosure of the Provisional Application 60/410,526 and the present application are identical. The Applicant further notes that Huang II is a 102(e) reference having a filing date of March 10, 2003 and claims priority to U.S. Provisional Application No. 60/363,791 (Huang I), which has a filing date of March 12, 2002. Accordingly, only the disclosure of Huang I is prior art to the present application.

Huang I is directed to a pulse oximeter that minimizes the brightness of LED emitters in order to conserve power. Accordingly, Huang I fails to disclose or suggest the method and/or apparatus set forth in relation to independent claims 1 and 12. For instance, Huang I fails to disclose or suggest, inter alia, altering the duty cycle of driving pulses supplied to emitters of a device for determining the amount of at least one light absorbing substance in subject. Further, Huang I fails to disclose transforming a detector signal into a frequency spectrum in order to determine a signal-to-noise ratio of that signal. Additionally, Huang I fails to disclose the use of the baseband portion of a detector signal for determination of a signal-to-noise ratio. In fact, Huang II teaches away from the use of the baseband or DC component of a detector signal in order to identify a signal characteristic of interest (e.g., signal-to-noise ratio). Specifically, Huang II provides:

> The received signal characteristics of interest in the Modulated Signal 26 and corresponding Received Signal 30 will include a steady state or time invariant, or "dc", component, such as a component due to the steady state volume of blood in a tissue or organ, a time varying or "ac" component indicative of the varying volume of blood flowing through the tissue or organ, and a "noise" component arising from

> various sources. The information sought to be extracted from the Modulated Signal 26 and Received Signal 30 for generating a Parameter Output 34 representing the oxygen saturation levels of blood in a body organ or tissues is thereby primarily the "ac" component of the signal, which is indicative of the varying volume of blood flowing through the tissue or organ. As such, either or both of the "dc" and "noise" components are either of less interest for these purposes or may interfere with the extraction of the information of interest. The amplitude or signal strength of the "ac" component is thereby representative of the Parameter 24, that is, the oxygen saturation level, while the ratio of the amplitude of the "ac" component relative to other signal components, that is, the signal to noise ratio of the "ac" component, is pertinent to the "quality" of the Modulated Signal 26 and Received Signal 30. Page 5, Paragraph 38.

Accordingly, for these reasons Applicant respectfully requests that the rejections based on Huang to Independent Claims 1 and 12 be withdrawn.

The examiner also rejected the dependent claims 4 and 9 under 35 U.S.C. 103(a) as being unpatentable under Huang II in view of various combinations and of U.S. Patent Nos. 5,348,004 to Hollub, 4,856,057 to Taylor et al., and 6,714,803 to Mortz. Applicant respectfully submits these claims each depend from an allowable base claim (independent claim 1) and are therefore allowable for the reasons set forth above. Accordingly, applicant requests that this rejection be withdrawn.

Claims 1, 10-12 and 16 were also rejected under 35 U.S.C. §103(a) as being unpatenable over U.S. Patent No. 6,731,967 to Turcott in view of U.S. Patent No. 6,356,774 to Bernstein et al.. As set forth below, all the claims are believed to be allowable as presented and therefore, this rejection is respectfully traversed.

As noted above, claims 1 and 12 are directed to a method and apparatus for controlling optical power in a monitoring device in manner that reduces power consumption without compromising the performance of the device. More specifically, emitters emit radiation at a minimum of two wavelengths as determined by a driving means that activate the emitters and a detector receives the radiation and produces an electrical signal in response to the received radiation. The electrical signal is demodulated and a baseband signal, e.g. a "DC component", of the electrical signal is obtained. This baseband signal is then transformed into a frequency spectrum such that a signal-to-noise ratio of the baseband signal may be identified. The signal-to-noise ratio is then monitored such that the duty cycle of the driving pulses, which are utilized drive the emitters, may be varied to reduce the total power consumption of the monitoring device.

Turcott is directed a system and method for providing a relatively constant average light intensity at light detector of a plethysmographic device. Col. 5 line 65 - Col. 6 line 6. In this regard, movement of detected light intensity of from a set point induces and increase or decrease of source intensity. "Specifically, if the detected light moves above (i.e., higher than) the set point, then the source intensity is decreased." Col. 6 lines 13-15. Such a system purportedly reduces power consumption of the device. Col. 2 lines 53- 57. As presented, Turcott utilizes a detector output signal that is indicative of the light intensity received by the detector as a feedback signal (Col. 15 lines 50-55) for adjusting source intensity. However, Turcott fails to disclose or suggest, inter alia, isolation of a baseband signal from a detector signal or use of the baseband signal to obtain a signal-to-noise ratio. As Turcott fails to isolate a baseband signal, Turcott unsurprisingly fails to disclose or suggest transforming such a baseband signal into a frequency spectrum to calculate such a signal-to-noise ratio. Likewise, Turcott fails to disclose monitoring a signal-to-noise ratio for use in adjusting the duty cycle of driving pulses supplied to emitters.

Bernstein fails to overcome the shortcomings of Turcott. As presented, Bernstein is directed to a method for operating a light emitter of an oximeter sensor at its maximum allowable intensity without burning a patient. See Abstract. In this regard, a temperature-dependent electrical characteristic is encoded into the sensor. The encoded temperature-dependent electrical characteristic may be read and utilize modify the driving of the light emitter in the sensor. This purportedly allows a light emitter to be operated its maximum allowable intensity to maximize a signal-to-noise ratio, without burning a patient. Col 2 line 59 – Col 3 line 4. However, Bernstein fails to disclose or suggest isolating a baseband signal, e.g. a "DC component", of a detector signal, transforming the baseband signal into a frequency spectrum in order to determine a signal-to-noise ratio, or, monitoring the signal-to-noise ratio to vary the duty cycle of driving pulses supplied to emitters.

Applicant submits that the proposed combination of Turcott and Bernstein would not produce the claimed subject matter of claims 1 and 12. Specifically, neither cited reference disclose obtaining a baseband signal (e.g., DC component) from a detector output and/or transforming a signal into a frequency spectrum in order to obtain a signal-to-noise ratio for that signal. In addition to the noted shortcomings, applicant further submits a combination of Turcott and Bernstein is improper as Bernstein is directed to a system and method for maximizing source intensity whereas Turcott is at least partially directed to system and method for allowing power consumption to be minimized. Col.

2 lines 53 - 57. Stated otherwise, Bernstein teaches away from Turcott. Accordingly, there is simply no motivation for one skilled in the art to make the combination suggested by the examiner. Accordingly, applicant submits that independent claims 1 and 12 are allowable as presented.

Based upon the foregoing, Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,

MARSH FISCHMANN & BREYFOGLE LLP

By: Thomas Marsh

Thomas R. Marsh
Registration No. 31,039
3151 South Vaughn Way, Suite 411
Aurora, Colorado 80014
Telephone: (303) 338-0997
Facsimile: (303) 338-1514

Date: November 29, 2004